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E2A AGD A300 A303 A306 A370 A375 A379

(56) Documents cited
GB 2177647 A GB 1367632 A GB 0819506 A
GB 0582077 A GB 0251173 A WO 87/01643 A
US 4258908 A

(58) Field of search
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(54) Clamp

(57) A clamp comprises first and second clamp jaws (12, 13), the relative positions of which are controllable by linearly displaceable screw and nut mechanism (22, 21), in which one (12) of the said jaws is coupled to the said mechanism (22, 21) by a coupling (24, 25, 27) which is disengageable to allow relative displacement between the jaw (12) and the mechanism (22, 21), at least over a limited range free from the constraint imposed by the said actuation means.

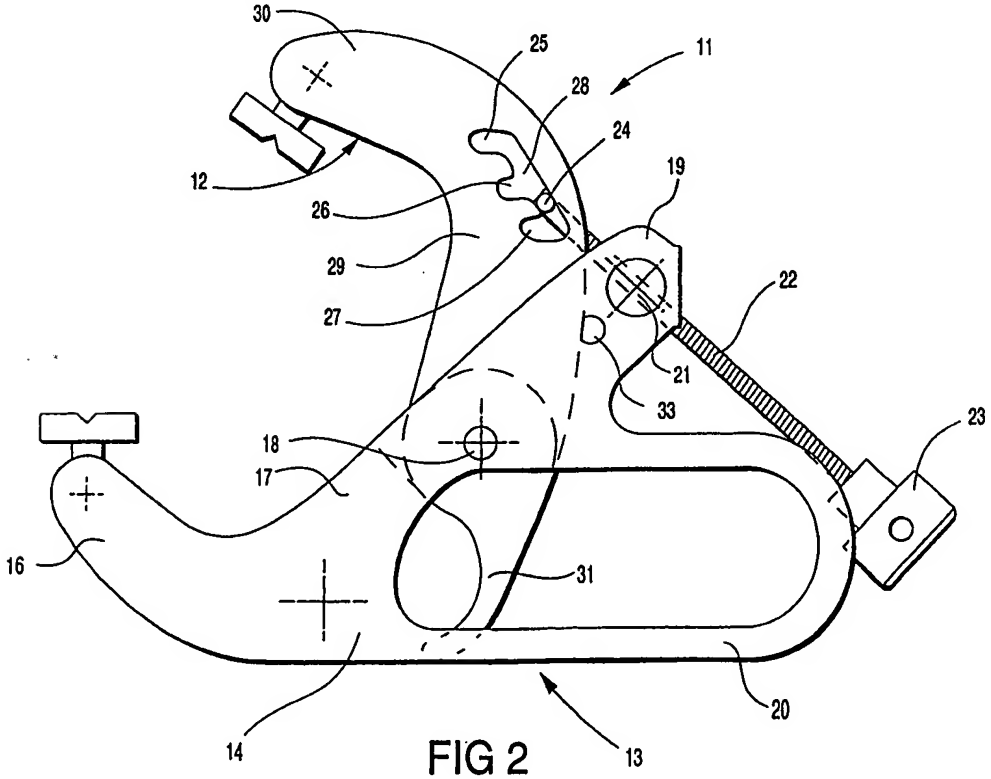

FIG 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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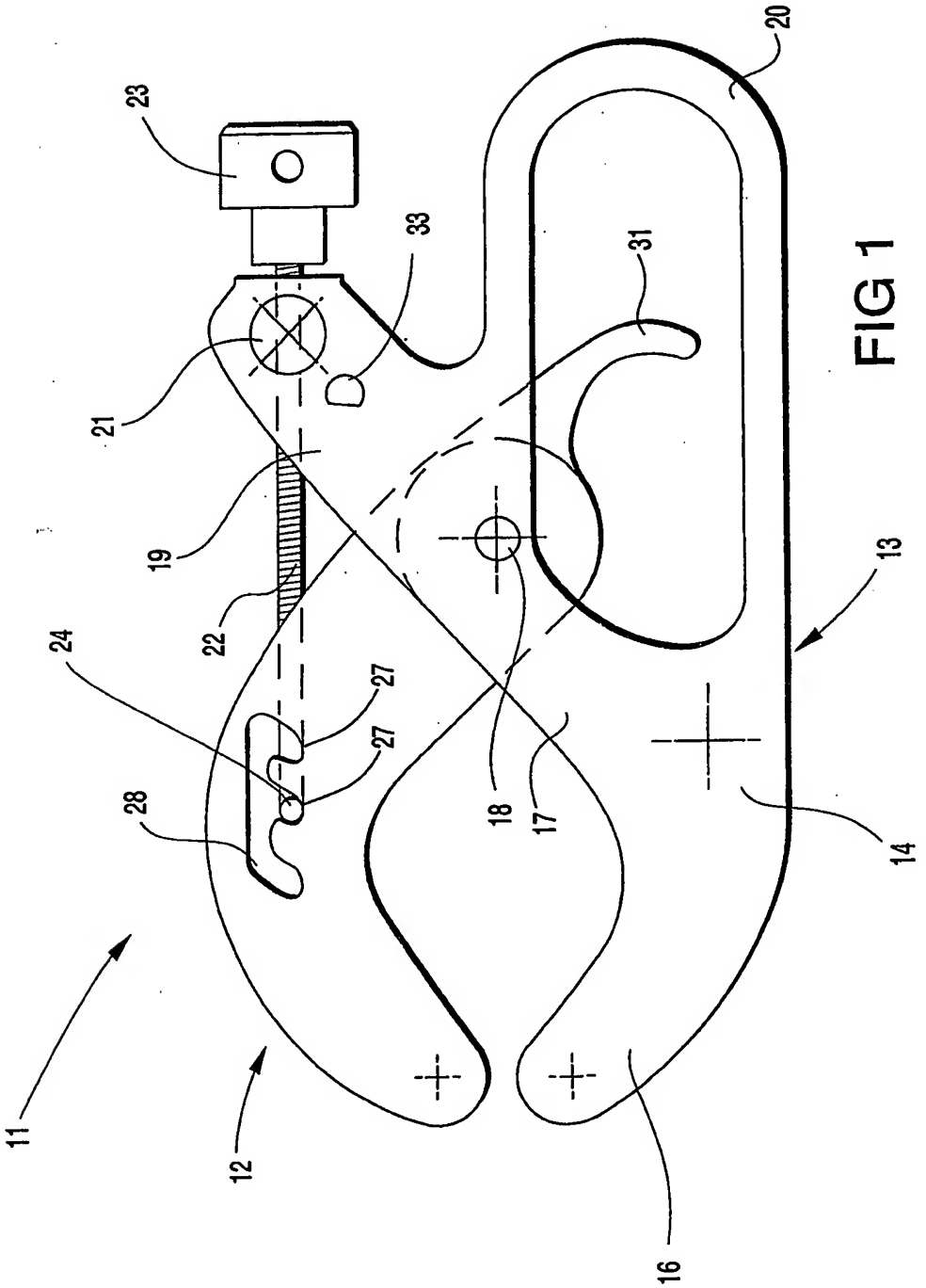

FIG 1

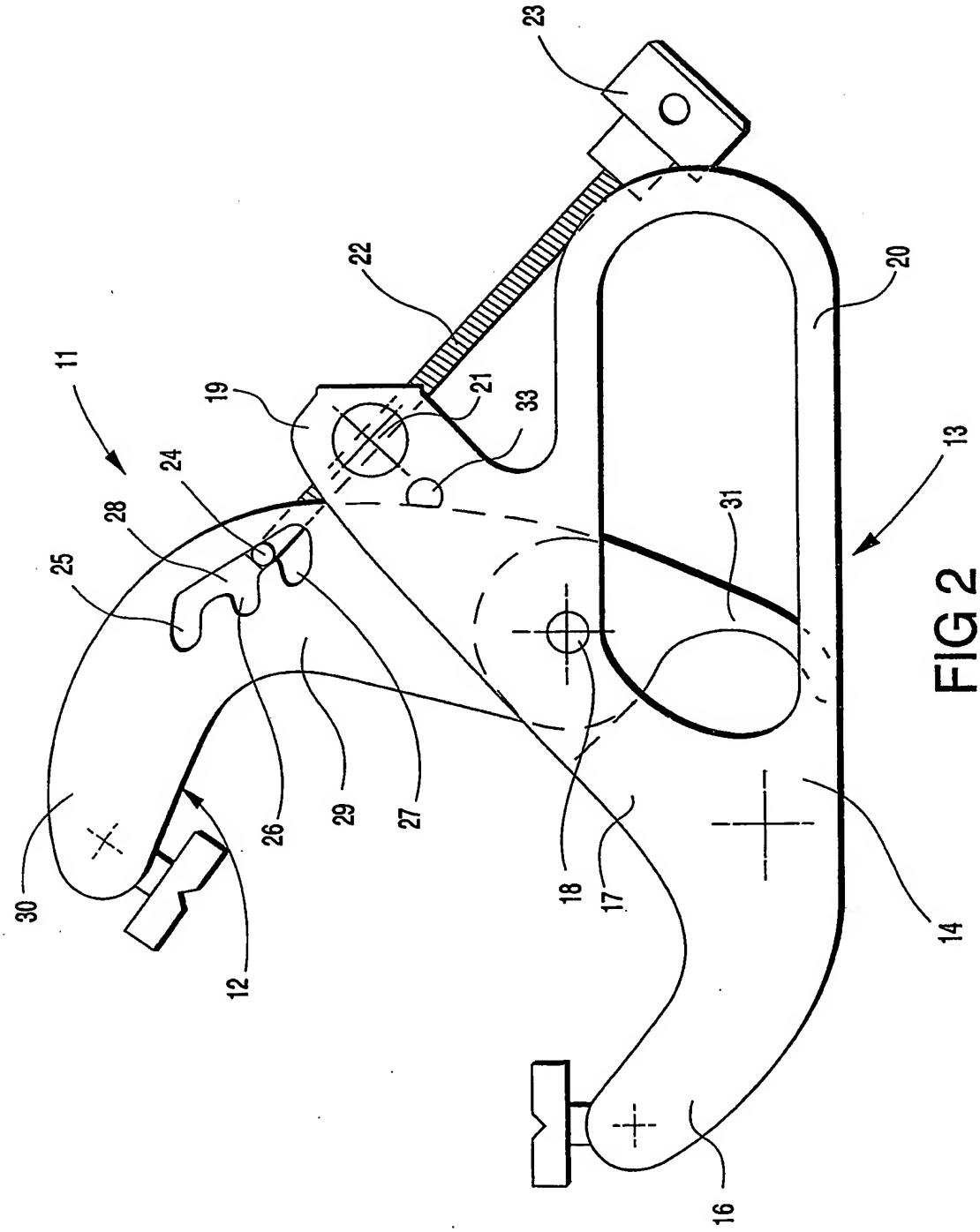

FIG 2

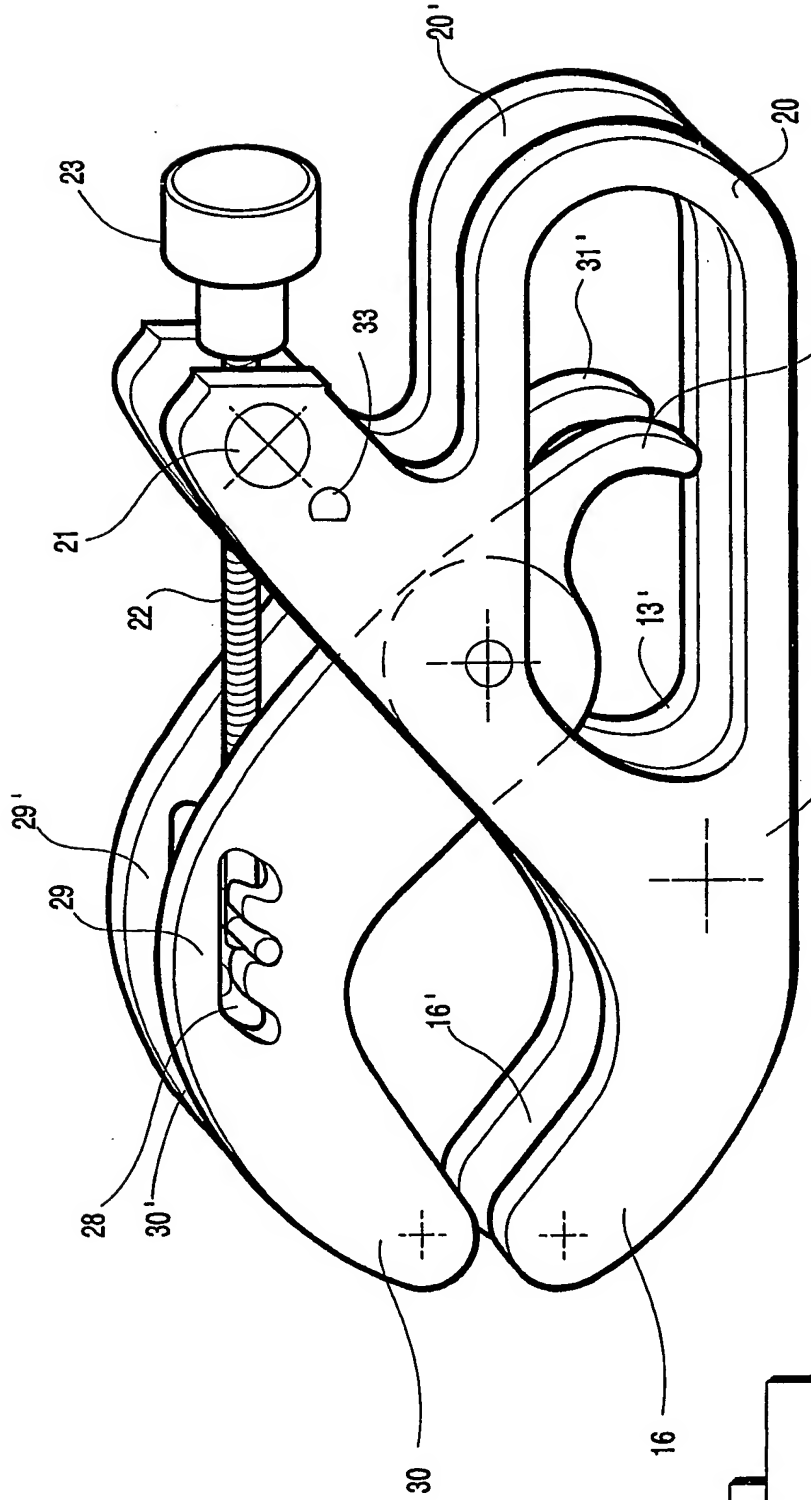

FIG 3

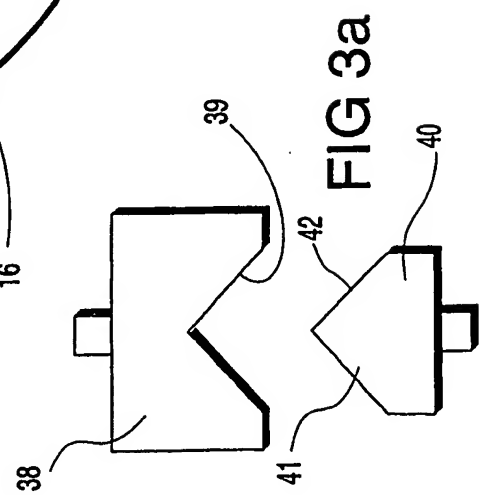

FIG 3a

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AN IMPROVED CLAMP

The present invention relates generally to clamps, and in particular to an improved clamp having a construction which makes it more versatile and easier to use.

Clamps for securing small components together, for example for assembly or during curing of adhesive fall into three main types. Of these by far the most common is the so-called G-clamp which comprises a monolithic G-shape body with a single elongate screw passing through a threaded opening and spanning the mouth defined by the G. Such clamps are rigid, robust and effective, but have limitations in their range of use due to that fact that the maximum opening between the jaws is determined by the rigid body so that, in close work, the size of the clamp may be an inconvenience. Such clamps also have a relatively large dimensions parallel to the opening movement of the jaw which can be a limiting factor in fitting such clamps in some circumstances.

The second conventional known clamp in the so-called sash cramp, which is a linear clamp having one jaw slidable along a linear guide with its movement controlled by a screw threaded shaft engaged on the guide, and the other jaw fixed in one of a number of predetermined positions by passing a transverse pin through aligned apertures in

the jaw and one of a set of apertures provided in the linear guide. Such clamps, are usually used for securing relatively large items together.

The third known clamp is the so-called crab clamp produced and sold by the present applicant. This known clamp comprises two pivoted jaws the opening movement of which is controlled by a screw threaded shaft which is threadedly engaged in a member attached to one jaw and engaged in a socket in the other jaw which allows relative turning movement of the shaft about its axis and limited angular movement between the jaw and the threaded shaft. Typically a ball and socket coupling is used for this purpose.

A major disadvantage in the use of both G-clamps and crab clamps lies in the fact that the whole of the range of movement of the jaws from fully closed to fully open can only be achieved by rotating the screw threaded linear actuation member about its axis. This is a time consuming and tedious operation if the jaws have to be opened and closed over their full range frequently. It also happens very often that a user may have partly assembled the components to be clamped before picking up the clamp to fit it onto the work pieces and will therefore be hampered by the fact that one hand is already occupied in holding together the work piece so that only the other hand is free to operate the clamp.

The present invention seeks to provide an improved clamp in which the above mentioned disadvantages of known clamps are overcome. According to the present invention a clamp comprising first and second clamp jaws the relative positions of which are controlled by linear actuation means is so formed that one of the said jaws is coupled to the linear actuation means by a coupling which is disengageable to allow relative displacement between the jaw and the linear actuation means at least over a limited range free from the constraint imposed by the linear actuation member.

Preferably the disengageable coupling is structured to allow relative engagement of the coupling parts in more than one position so that a rapid displacement of the jaws from one position to another can be achieved quickly by disengaging the coupling, moving the jaws while the coupling is disengaged, and then re-engaging the coupling in a new relative configuration, in which configuration the linear actuation means may be operated in the usual way to effect fine adjustment of the jaws and/or to apply a clamping force to a work piece or assembly located between the jaws.

The said disengageable coupling therefore preferably comprising cooperating coupling parts engageable in a first relative configuration in which the coupling parts are constrained against relative displacement and a

second relative configuration in which the coupling parts are relatively displaceable over at least a limited range of movement.

In a preferred embodiment of the invention the said disengageable coupling parts comprise a generally laminar member having at least one notch and a connector spigot engageable in the notch and disengageable therefrom by displacement generally transversely of the line of action of the linear actuation means.

The said notch or notches in the laminar member may be formed in one edge of an elongate slot within which the said connector spigot is captive. The elongate slot thus defines the said limited range of movement of the jaws with the disengageable coupling in the said second relative configuration.

The said laminar member may be formed as or carried on the said one jaw of the clamp, and the said connector spigot may be carried on or by the said linear actuation member. Alternatively, of course, the said laminar member may be carried on or by the said linear actuation member and the said connector spigot be carried on or by the said one jaw.

In the preferred embodiments described herein below the jaws are pivotally connected for relative movement

between closed and open positions although it will be appreciated that the invention defined herein is not limited to a clamp having pivoted jaws, and may equally be applicable to a clamp having jaws which are relatively displaceable linearly (but not necessarily rectilinearly).

The said linear actuation member may be an elongate screw threaded shaft or may alternatively be a fluid pressure actuator capable of linear displacement.

If the linear actuation member is formed as a screw threaded shaft this is preferably threadedly engaged in or in a member carried on or by the said other jaw. Alternatively, however, the screw threaded shaft may be treadedly engaged in or in a member carried on or by the said connector spigot.

In embodiments in which the said jaws are pivotally connected together the said jaws may have parts projecting beyond the pivotal connection whereby to allow manual manipulation thereof. In particular the said one jaw may be provided with an element useable as a trigger engageable by one finger to effect turning movement about the pivot.

The clamp of the present invention may also be provided with jaw pads which are turnable with respect to the jaws

about an axis generally parallel to the line of relative movement of the jaw pads as the jaws move between their open and close positions. Such jaw pads may be provided with surface formations to improve grip, such as surface roughening, V-grooves, or the like in one embodiment of the invention the swivel jaw pads are each provided with a single V-groove extending diametrally across the contact face of the jaw pad (the contact face being that face which, in use, engages or contacts the work piece or, in the case of the clamp being closed without the introduction of a work piece, the other jaw)

For special purposes one or other of the swivel jaw pads may be provided with a surface configuration including two plane surfaces meeting at a junction line at an angle greater than 180_0 whereby to fit in a cooperating manner within a V-groove of complimentary angle.

Embodiments of the present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a side view of an embodiment of the invention showing the jaws closed and the said disengageable coupling in a first configuration;

Figure 2 is a side view similar to Figure 1, showing the jaws open and the disengageable coupling in a second configuration; and

Figure 3 is a perspective view of an embodiment of the invention fitted with different jaw pads.

Referring now to the drawings the clamp illustrated is generally identified with the reference number 11 and comprises a first jaw 12 corresponding to the said one jaw defined hereinabove, and a second jaw 13 corresponding to the said other jaw defined hereinabove. The said other jaw 13 is composed, as can be seen in Figure 3, of two generally parallel plate-like members 14,14' whilst the first jaw 12 likewise is composed of two parallel plate-like members 15, 15'.

Each of the said two plate-like members 14,14' of the said upper jaw 13 comprises a curved arm 16 projecting from a body portion 17 through which passes a main pivot pin 18 and laterally from which extends a reaction arm 19.

Projecting rearwardly away from the clamp arm 16 and approximately 60_0 from the rear axial arm 19 is a closed loop 20. This serves as a control member into which one or more fingers can be inserted for manipulation of the said other jaw 13 as will be described in more detail hereinbelow.

It will be appreciated from Figure 3 that the parallel jaw plate 14' is identical in shape to the jaw plate 14

and corresponding components thereof are therefore identified with the same reference numerals with an added apostrophe. The two jaw plates 14 are secured together by the pivot pin 18 and by a pivoted transverse reaction pin 21 through which passes a threaded shaft 22 which is treadedly engaged within a diametral opening in the reaction pin 21. At one end of the threaded shaft 22 there is a control wheel 23 turnable by the operator to cause the threaded shaft 22 to be moved longitudinally through the reaction pin 21 as it is screwed in one direction or the other. At the other end of the threaded shaft 22 there is fitted a transverse connector spigot 24 which is secured to the threaded shaft 22 in such a way as to be restrained against relative longitudinal displacement along the shaft 22, but can turn about the axis of the shaft 22; in practice, since the connector spigot 24 is restrained against rotation, this means that the shaft 22 can turn about its own axis relative to the connector spigot 24. In the relative configuration illustrated in Figure 1, the connector spigot 24 is engaged in a notch 26 formed in one edge of an elongate slot 28 in a jaw plat 29 constituting the main body of the said one jaw 12. The elongate slot 28 in fact has three transverse notches 25, 26, 27 in the longitudinal edge thereof, each said notch having parallel lateral sides which are inclined at a shallow angle to the normal to the axis of the threaded shaft 22 when the connector spigot 24 is engaged in one of the notches. Extending

from the jaw plate 29, in a direction away from the free end 30 thereof is a trigger arm 31 which is substantially entirely located within the loop 20 of the said other jaw plate 14.

In the relative configuration of the disengageable coupling constituted by the notched slot 28 and the transverse connector spigot 24 movement of the free end 30 of the jaw plate 29 towards or away from the arm 16 of the jaw plate 14 is controlled by turning the hand wheel 23 about the axis of the threaded shaft 22. With a work piece positioned between the free end 30 of the jaw plate 29 and the arm 16 of the jaw plate 14, therefore, turning the locking wheel 23 in one direction will close the jaws onto the work piece, and turning the hand wheel 23 in the opposite direction will release the jaws from the work piece.

If it is desired to make a major relative displacement of the jaws this can be effected by disengaging the connector spigot from the notch 26 by applying a force between the trigger 31 and the hand wheel 23 in a direction such as to urge these towards one another thereby applying a relative turning force between the two jaw plates 14, 29 such that the jaw plate 29 is urged in an anti-clockwise direction (as viewed in Figure 1) with respect to the jaw plate 14 and the threaded shaft 22 is urged in a clockwise direction with respect to the

reaction arm 19 of the jaw plate 14. This causes the connector spigot 24 to move out from the notch 26 into the main void of the elongate lock 28, in which position the jaw plate 29 can be turned about the pivot pin 18 over a range of motion limited only by the contact of the connector spigot 24 with opposite ends of the elongate slot 28. Maximum opening of the jaw is illustrated in Figure 2 in which it will be seen that the jaw plate 29 has been rotated clockwise from the position illustrated in Figure 1 until it engages an abutment 33 on the reaction arm 19. In this position a work piece may be located conveniently between the jaws, holding it with one hand whilst the clamp 11 is held in the other hand with either a finger in engagement with the trigger level 31 and the thumb engaged on the locking screw 33 (or vice versa) allowing the jaws to be closed over the workpiece by pressing on the trigger lever 31 to cause the jaw plate 29 to turn in an anti-clockwise direction with respect to the jaw plate 14 until the jaws engage the workpiece. A light pressure between the jaws on the workpiece can be maintained by the force exerted between the trigger 31 and the loop 20, both of which can readily engaged by the same hand then, by suitably turning the locking screw 23 the connector spigot 24 can be brought into register with the nearest of the notches 25, 26, 27 (assuming it is not already in register with one of them) and then the threaded shaft can be cause to turn about the axis of the reaction pin 21 to displace the connector

spigot 24 from the slot 28 into the selected notch 25, 26, 27, this being achieved by applying a force to the locking screw 23 by the thumb or finger of the hand holding the clamp 11, to cause it and therefore the threaded shaft 22 to turn about the axis of the reaction pin 21.

Thereafter, by turning the hand wheel 23 about the axis of the locking screw 22 the connector spigot 24 can be urged away from the reaction pin 21 to cause the jaws to close onto the work piece and clamp them in position there with whatever force is required by turning the hand wheel 23.

In order to adapt the clamp 11 to different work pieces removable jaw pads as shown in the drawings may be provided. As will be appreciated the jaw pads 34, 35 illustrated in Figure 3 are turnable about swivel axes parallel to the direction of relative movement between the jaw pads 34, 35 when the jaws are moved towards or away from one another in order to allow the jaw pads to be moved into a position where the V-grooves 36, 37 of the pads 34, 35 respectively are aligned with a major surface feature of the work piece. Figure 3a shows an alternative paid of jaw pads in which a first pad 38 has a V-groove 39 whilst the cooperating pad 40 has two inclined faces 41, 42 defining a ridge 43 at a complimentary angle to that of the V-groove 39 allowing

the jaw pad 40 to engage within the recess formed by the V-groove 39 in the jaw pad 38.

CLAIMS

1. A clamp comprising first and second clamp jaws the relative positions of which are controllable by linearly displaceable actuation means, in which one of the said jaws is coupled to the said actuation means by a coupling which is disengageable to allow relative displacement between the jaw and the actuation means at least over a limited range free from the constraint imposed by the said actuation means.

2. A clamp as claimed in Claim 1, in which the said disengageable coupling comprises cooperating coupling parts engageable in a first relative configuration in which the coupling parts are constrained against relative displacement and a second relative configuration in which the coupling parts are relatively displaceable over at least a limited range of movement.

3. A clamp as claimed in Claim 1 or Claim 2, in which the said disengageable coupling parts comprise a member having at least one notch and a connector spigot engageable in the notch and disengageable therefrom by displacement generally transversely of the line of action of the linear actuation means.

4. A clamp as claimed in Claim 3, in which the said

notch or notches in the said member is or are formed in one edge of an elongate slot within which the said connection spigot is captive.

5. A clamp as claimed in Claim 3 or Claim 4, in which the said member is the said one jaw of the clamp and the said connector spigot is carried on or by the said linear actuation member.

6. A clamp as claimed in Claim 3 or Claim 4, in which the said member is carried on or by the said linear actuation member and the said connector spigot is carried on or by the said one jaw.

7. A clamp as claimed in any preceding claim, in which the said actuation member is an elongate screw threaded shaft.

8. A clamp as claimed in Claim 7, in which the said screw threaded shaft is threadedly engaged in or in a member carried on or by the other jaw.

9. A clamp as claimed in any preceding Claim, in which the said jaws are pivotally connected together.

10. A clamp as claimed in Claim 9, in which the said jaws have parts projecting beyond the said pivotal connection to allow manual manipulation thereof.

11. A clamp as claimed in any preceding claim in which one or both of said jaws is equipped with a jaw pad turnable about a respective axis.

12. A clamp as claimed in Claim 11, in which the or each said jaw pad has a V-shape groove in a face thereof.

13. A clamp as claimed in Claim 11 in which one said jaw pad has a V-shape groove and the other said jaw pad has a correspondingly shaped ridge for engagement therein upon closure of the jaws.

14. A clamp substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

- 16 -

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number

GB 9300417.4

Relevant Technical fields

(i) UK Cl (Edition L) B4W (W3K1, W3K3, W3KX, W3L1); E2A (AGD, AGKF)

(ii) Int Cl (Edition 5) B25B (1/12, 5/04, 5/10); F16B (2/06, 2/10)

Search Examiner

J A MULLEN

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

14 APRIL 1993

Documents considered relevant following a search in respect of claims 1-14

Category (see over)	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2177647 A	(VERDON)	1-12
X	GB 1367632	(RABONE CHESTERMAN LTD)	1-8 at least
X	GB 0819506	(WILTON TOOL MFG CO INC)	1-8 at least
X	GB 0582077	(WELLS)	1-12
X	GB 0251173	(BOADLE)	1-12
X	WO 87/01643	(MILLER CLAMPS GmbH)	1-12
X	US 4258908	(GOFF)	1-12

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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